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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,078	12/14/2004	Mark Berman	JHN-267-88	4230

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EXAMINER	
PARK, EDWARD	
ART UNIT	PAPER NUMBER
2624	
MAIL DATE	DELIVERY MODE
11/25/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/510,078	BERMAN ET AL.	
	Examiner	Art Unit	
	EDWARD PARK	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5,6 and 10-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 5, 6, 10-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/23/08 has been entered.

Claim Objections

2. In response to applicant's amendment of claims 16 and 17, the previous claim objections are withdrawn.

Claim Rejections - 35 USC § 112

3. In response to applicant's amendment of claims 1, 5, 12, 13, 14, the previous claim rejection is withdrawn.

In response to applicant's amendment of claims 1, 12, 13, the previous claim rejection is withdrawn.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. **Claims 1, 2, 5, 6, 10-17** are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing (Reference the May 15, 2008 memorandum issued by Deputy Commissioner for Patent Examining Policy, John J. Love, titled "Clarification of 'Processes' under 35 U.S.C. 101" – publicly available at USPTO.GOV, "memorandum to examining corp"). The instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process. In order for a process to be "tied" to another statutory category, the structure of another statutory category should be positively recited in a step or steps significant to the basic inventive concept, and NOT just in association with statements of intended use or purpose, insignificant pre or post solution activity, or implicitly.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1, 2, 5, 6, 10, 11, 12, 13, 14, 15, 16, 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Keshava et al ("Spectral Unmixing", IEEE Signal Processing Magazine) in view of Sunshine et al (US 6,608,931 B2).

Regarding **claims 1, 12, 13, 14, 15**, Keshava discloses a method of identifying endmember spectra values from multispectral image data, where each multispectral data value is equal to a sum of mixing proportions of each endmember spectrum, said method including the steps of:

processing the data to obtain a multidimensional simplex having a number of vertices equal to the number of endmembers, the position of each vertex representing a spectrum of one of the endmembers (see p. 53, left column, paragraph 3 – p. 53, right column, paragraph 1, estimates of endmember spectra may be derived from the vertices of the multifaceted simplex that tightly encloses the data and has the same number of endmembers as vertices),

wherein the processing of the data includes: providing starting estimates of each endmember spectrum for each image data value (see p. 51, right column, paragraph 2 - p. 52, left column, paragraph 1 define a suite of image endmembers (selected from the image data), an image endmember is obtained by locating a pixel in the scene with the maximum abundance of the physical endmember it will represent);

estimating mixing proportions for each data value from the estimates of the spectra of all the endmembers (see p. 54, right column, paragraph 1, endmember determination is often interrelated with estimating the abundance vector, a, in the LMM (linear mixing model));

estimating the spectrum of each endmember from the estimates of the mixing proportions of the spectra of all the endmembers for each image data value (see p. 50, right column, paragraph 2 -

p. 54, left column, last paragraph, geometric endmember determination ... estimates of endmember spectra may be derived from the vertices of the multifaceted simplex that most tightly encloses the data and has the same number of endmembers as vertices), wherein the regularized residual sum of squares includes a term which is a measure of the size of the simplex (see pg. 55, left column, complementary constraint, nonnegativity, is not as easy to address in closed form as full additivity, minimizing |x-Sa|^2 while maintaining a>=0, i=1, ...M, fall sin the domain of quadratic programming with linear inequalities as constraints).

Keshava does not disclose repeating the estimation of the mixing proportions and the estimation of the spectrum of each endmember until a stopping condition is met, wherein the stopping condition occurs when a relative change in a regularized residual sum of squares determined in the estimation steps attains a threshold, wherein the regularized residual sum of squares is reflective of a difference between the multispectral image data and a calculated vale based on the estimated mixing proportions and estimated spectrum of each endmember; minimizing a first regularized residual sum of squares, the first regularized residual sum of squares, and minimizing a second regularized residual sum of squares, the second regularized residual sum of squares; calculating a ratio comprising successive values of a minimized regularized residual sum of squares, wherein the successive values of the minimized regularized residual sum of squares are minima of the second and first regularized residual sum of squares calculated for each repetition of the estimation steps; and when the ratio attains a tolerance value.

Sunshine, in the same field of endeavor, teaches repeating the estimation of the mixing proportions and the estimation of the spectrum of each endmember until a stopping condition is met, wherein the stopping condition occurs when a relative change in a regularized residual sum

of squares determined in the estimation steps attains a threshold (see col. 3, lines 61-67, col. 4, lines 1-26; calculating a root mean square (RMS) error for the N pixels by combining the error values for the residual spectra; determining an acceptable range of deviation from the mean RMS error; comparing each of the RMS error values for each of the N pixels to the acceptable range of deviation from the mean RMS error and keeping the M pixels that are within the acceptable range of deviation), wherein the regularized residual sum of squares is reflective of a difference between the multispectral image data and a calculated vale based on the estimated mixing proportions and estimated spectrum of each endmember (see col. 3, lines 61-67, col. 4, lines 1-26; calculating a root mean square (RMS) error); minimizing a first regularized residual sum of squares, the first regularized residual sum of squares (see col. 3, lines 61-67, col. 4, lines 1-26), and minimizing a second regularized residual sum of squares, the second regularized residual sum of squares (see col. 3, lines 61-67, col. 4, lines 1-26; the root mean square is executed until the mean RMS error is within an acceptable range of deviation); calculating a ratio comprising successive values of a minimized regularized residual sum of squares, wherein the successive values of the minimized regularized residual sum of squares are minima of the second and first regularized residual sum of squares calculated for each repetition of the estimation steps (see col. 3, lines 61-67, col. 4, lines 1-26); and when the ratio attains a tolerance value (see col. 3, lines 61-67, col. 4, lines 1-26; mean RMS error is within an acceptable range).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Keshava to utilize a repeating estimation, regularized residual sum of squares, and a tolerance value as suggested by Sunshine, to decrease the likelihood of greater error; faster

execution, more objective, more cost-effective, more efficient process, and enhancement of the utility of spectral imagery (see col. 2, lines 1-19).

Regarding **claim 2**, Keshava discloses sum of the squared distances between all of the simplex vertices (see p. 54, right column, paragraphs 1-5 least squares method .... estimates is a distance metric that is minimized).

In regards to **claims 5 and 6**, Keshava with Sunshine discloses all elements as mentioned above in claim 1.

Keshava with Sunshine does not disclose expressly a ratio comprising successive values of the regularized residual sum of squares and ratio attains 0.99999.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have a ratio comprising successive values of regularized residual sum of squares and ratio attains 0.99999. Applicant has not disclosed that a ratio comprising successive values of the regularized residual sum of squares and ratio attains 0.99999 provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either a regularized residual sum of squares as taught by Keshava with Sunshine in claim 1 or a ratio comprising successive values of the regularized residual sum of squares and ratio attains 0.99999 because both utilize the regularized residual sum of squares which performs the same function of minimizing the error of the endmember spectra values.

Therefore, it would have been obvious to combine to one of ordinary skill in this art to modify Keshava with Sunshine to obtain the invention as specified in claims 5 and 6.

Regarding **claim 10**, Keshava discloses utilizing a linear estimation technique (see pg. 55, left column, section nonnegativity).

Regarding **claim 11**, Keshava discloses utilizing a quadratic programming minimization technique (see p. 55, left column, paragraph 2, minimizing while maintaining falls in the domain of quadratic programming with linear inequalities as constraints).

Regarding **claim 16**, Keshava discloses identified endmember spectra values from the multispectral image data (see p. 53, left column, paragraph 3 – p. 53, right column, paragraph 1, estimates of endmember spectra may be derived from the vertices of the multifaceted simplex that tightly encloses the data and has the same number of endmembers as vertices).

Regarding **claim 17**, Keshava discloses identified proportions of each of the identified endmember spectra values present in each data value of the multispectral image data (see p. 54, right column, paragraph 1, endmember determination is often interrelated with estimating the abundance vector, a, in the LMM (linear mixing model)).

Response to Arguments

8. Applicant's arguments filed on 10/23/08, in regards to claim 1, have been fully considered but they are not persuasive. Applicant argues that Keshava does not disclose the method of claim 1 because Keshava views the steps as distinct and consecutive (see pg. 9, last paragraph). This argument is not considered persuasive since Keshava discloses all the elements as cited in claim 1. Because the Keshava reference has different sections within the reference does not indicate that the steps are distinct and consecutive. Even so, having the steps as distinct

and consecutive does not limit a reference from meeting the limitations of the claim. For example, applicant argues that the Keshava reference begins with dimension reduction, followed by endmember determination, and ending with inversion. It is clear that the methods are distinct in functionality but are related to one another since for various reasons, one being that they all utilize endmembers or pixels. Regardless, the argument that it is not anticipated is not considered persuasive due to the fact that the Keshava views the steps as distinct and consecutive, since it has no bearing in regards to anticipation. Furthermore, as long as the reference contains the limitations of the claim and is able to utilize a technique on a previous method does not prevent the reference from meeting the limitations of the claim. It can be seen in Keshava that different algorithms and methods can be utilized in the endmember analysis and the advantages of each algorithm to be utilized. Examiner notes that claim 1 is rejected under a new ground(s) of rejection necessitated by applicant's amendment.

Applicant argues that Keshava takes a piece of a first technique, namely the geometric shrink-wrapping process, and arbitrarily combines it with a piece of the distinct subsequent technique of inversion (see pg. 10, last paragraph). This argument is not considered persuasive since it is clearly shown in Keshava, pg. 54, left column, that endmember determination is often interrelated with estimating the abundance vector, a, in the LMM; a key aspect of inversion is the incorporation of the dual physical constraints that the vector must obey. Therefore, the technique of inversion is not arbitrarily combined but rather supported by the Keshava reference to estimate the endmembers while reducing error. Examiner notes that claim 1 is rejected under a new ground(s) of rejection necessitated by applicant's amendment.

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that Keshava does not disclose a regularized residual sum of squares (see pg. 11, fourth paragraph). This argument is not considered persuasive since claim 1 is rejected under a new ground(s) of rejection necessitated by applicant's amendment.

Applicant argues that Keshava does not disclose a measure of the size of the simplex (see pg. 11, last paragraph). This argument is not considered persuasive since Keshava discloses this in pg. 55, left column, where minimizing |x - Sa|^2 while maintaining a >= 0, i = 1, ... M, meets the limitation since x is considered to be a set of mixed pixel spectra, x. Examiner notes that claim 1 is rejected under a new ground(s) of rejection necessitated by applicant's amendment.

Applicant argues that Keshava teaches away from combining endmember determination with an inversion by stating they are a sequence of consecutive procedures and Keshava teaches away from combining a geometric technique with a statistical technique (see pg. 12, third paragraph). This argument is not considered persuasive since Keshava does not teach away from combining endmember determination with an inversion by stating they are a sequence of consecutive procedures. It is shown on pg. 54, right column, that the two methods are interrelated and therefore do not teach away from each other. This also applies to the geometric technique and statistical technique. It is not explicitly shown in the Keshava reference that the two methods teach away from each other.

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that Keshava does not disclose repeating the

estimation steps (see pg. 12, last paragraph). This argument is not considered persuasive since claim 1 is rejected under a new ground(s) of rejection necessitated by applicant's amendment.

Applicant argues that Keshava does not present a limitation in claim 2 (see pg. 13, second paragraph). This argument is not considered persuasive since Keshava discloses the limitations in claim 2 as seen above. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Applicant argues that the cited portion of Keshava does not disclose a linear estimation technique (see pg. 13, third paragraph). Although this statement is considered persuasive, Keshava does disclose a linear estimation technique in a different section on pg. 55, left column, nonnegativity.

Applicant's arguments with respect to claim 12 have been considered but are moot in view of the new ground(s) of rejection (see pg. 13, fourth paragraph). Examiner notes that a new ground(s) of rejection is necessitated by applicant's amendment and the rejection can be seen above.

Applicant's arguments with respect to claim 14 have been considered but are moot in view of the new ground(s) of rejection (see pg. 13, last paragraph). Examiner notes that a new ground(s) of rejection is necessitated by applicant's amendment and the rejection can be seen above.

Applicant's arguments with respect to claim 15 have been considered but are moot in view of the new ground(s) of rejection (see pg. 14, first paragraph). Examiner notes that a new

ground(s) of rejection is necessitated by applicant's amendment and the rejection can be seen above.

Applicant reiterates the same arguments as seen above within pg. 14, fourth paragraph – pg. 15, last paragraph. These arguments are not considered persuasive since they have already been addressed as seen above in the argument section or the arguments are mute in view of a new ground(s) of rejection necessitated by the applicant's amendment of claim 1.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to EDWARD PARK whose telephone number is (571)270-1576. The examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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